US009098996B2

(12) **United States Patent**
Barraci et al.

(10) **Patent No.: US 9,098,996 B2**
(45) **Date of Patent: Aug. 4, 2015**

(54) **METHODS AND SYSTEMS FOR INTEGRATING RUNWAY STATUS AND LAYOUT**

(75) Inventors: **Nima Barraci**, Frankfurt am Main (DE); **Thorsten Wiesemann**, Hofheim (DE); **Anja Soell**, Basel (CH)

(73) Assignee: **The Boeing Company**, Chicago, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 223 days.

(21) Appl. No.: **13/270,787**

(22) Filed: **Oct. 11, 2011**

(65) **Prior Publication Data**

US 2013/0090841 A1 Apr. 11, 2013

(51) **Int. Cl.**

G06F 19/00 (2011.01)
G08G 5/00 (2006.01)
G08G 5/02 (2006.01)

(52) **U.S. Cl.**

CPC ***G08G 5/0021*** (2013.01); ***G08G 5/0013*** (2013.01); ***G08G 5/025*** (2013.01)

(58) **Field of Classification Search**

None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,786,773	A	7/1998	Murphy	
6,920,390	B2	7/2005	Mallet et al.	
7,216,069	B2 *	5/2007	Hett	703/6
8,019,529	B1	9/2011	Sharma	
8,200,378	B1 *	6/2012	Chiew et al.	701/4
2006/0241820	A1 *	10/2006	Dwyer et al.	701/3
2008/0140727	A1 *	6/2008	Pschierer	707/200
2010/0026525	A1 *	2/2010	Feyereisen et al.	340/972
2010/0125403	A1	5/2010	Clark et al.	
2010/0250030	A1 *	9/2010	Nichols et al.	701/7
2011/0087428	A1	4/2011	Barnetche et al.	

FOREIGN PATENT DOCUMENTS

EP 2317488 A2 5/2011

OTHER PUBLICATIONS

GeoEye, "GeoEye—Airport Mapping Databases", Sep. 2009.*
Extended European Search Report of Application No. 12183945; Nov. 7, 2013; 8 pages.

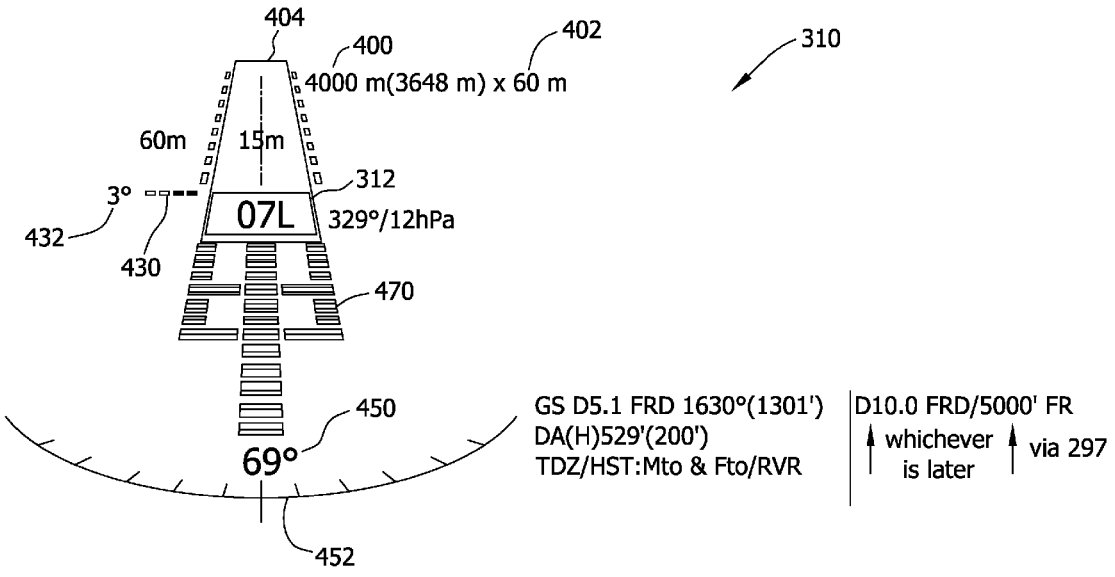
* cited by examiner

Primary Examiner — Thomas Tarcza
Assistant Examiner — Garrett Evans
(74) *Attorney, Agent, or Firm* — Armstrong Teasdale LLP

(57) **ABSTRACT**

A method for combining static runway information with runway status information for a selected runway is described. The method includes retrieving, with a processing device, static runway information for the selected runway from at least one database, retrieving, with the processing device, runway status information for the selected runway from at least one source of dynamic runway status information, generating, through a program executing on the processing device, a depiction of the selected runway on at least one display device, and generating for display proximate the runway depiction, through the execution of the program, a plurality of contextual symbology associated with the runway, the symbology based on the retrieved static runway information and the retrieved dynamic runway status information.

20 Claims, 8 Drawing Sheets



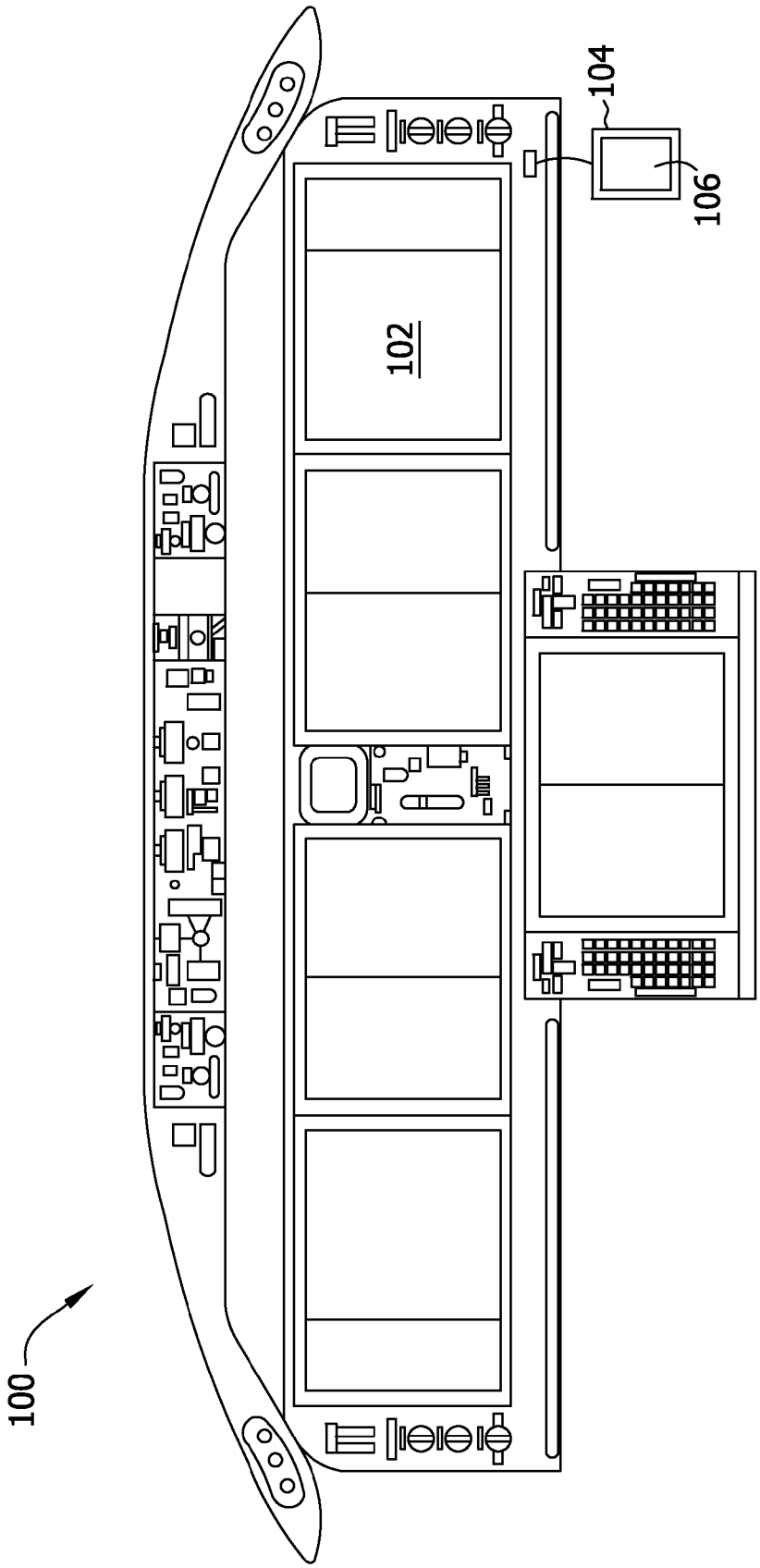


FIG. 1

FIG. 2

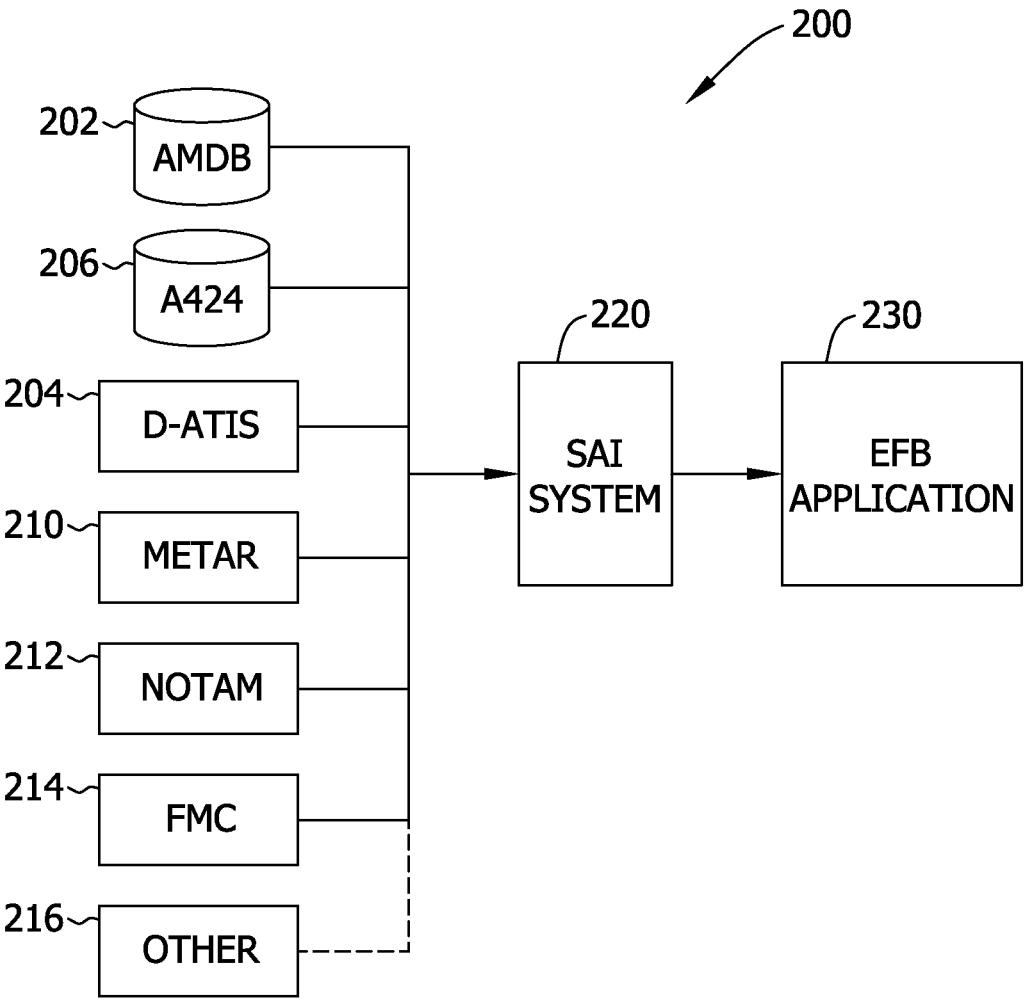
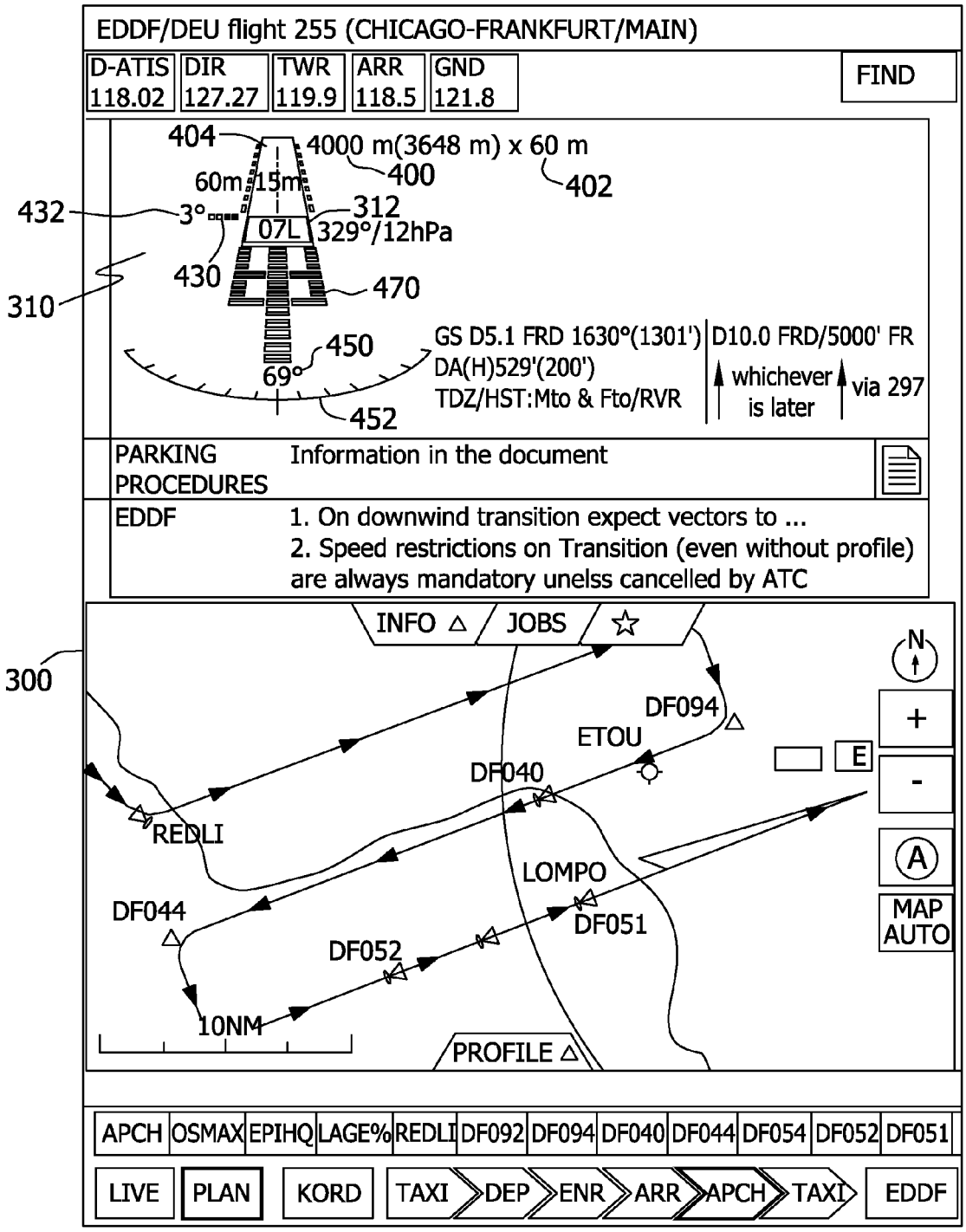

200
202
AMDB
206
A424
204
D-ATIS
210
METAR
212
NOTAM
214
FMC
216
OTHER
220
SAI SYSTEM
230
EFB APPLICATION

FIG. 3


EDDF/DEU flight 255 (CHICAGO-FRANKFURT/MAIN)
D-ATIS 118.02
DIR 127.27
TWR 119.9
ARR 118.5
GND 121.8
FIND
404
4000 m(3648 m) x 60 m
400
402
60m 15m
312
432
3°
07L
329°/12hPa
430
470
310
450
GS D5.1 FRD 1630°(1301')
DA(H)529'(200')
TDZ/HST:Mto & Fto/RVR
D10.0 FRD/5000' FR
whichever is later
via 297
69°
452
PARKING PROCEDURES
Information in the document
EDDF
1. On downwind transition expect vectors to ...
2. Speed restrictions on Transition (even without profile) are always mandatory unelss cancelled by ATC
300
INFO
JOBS
N
DF094
ETOU
DF040
E
REDLI
LOMPO
DF044
DF051
DF052
MAP AUTO
10NM
PROFILE
APCH OSMAX EPIHQ LAGE% REDLI DF092 DF094 DF040 DF044 DF054 DF052 DF051
LIVE
PLAN
KORD
TAXI
DEP
ENR
ARR
APCH
TAXI
EDDF

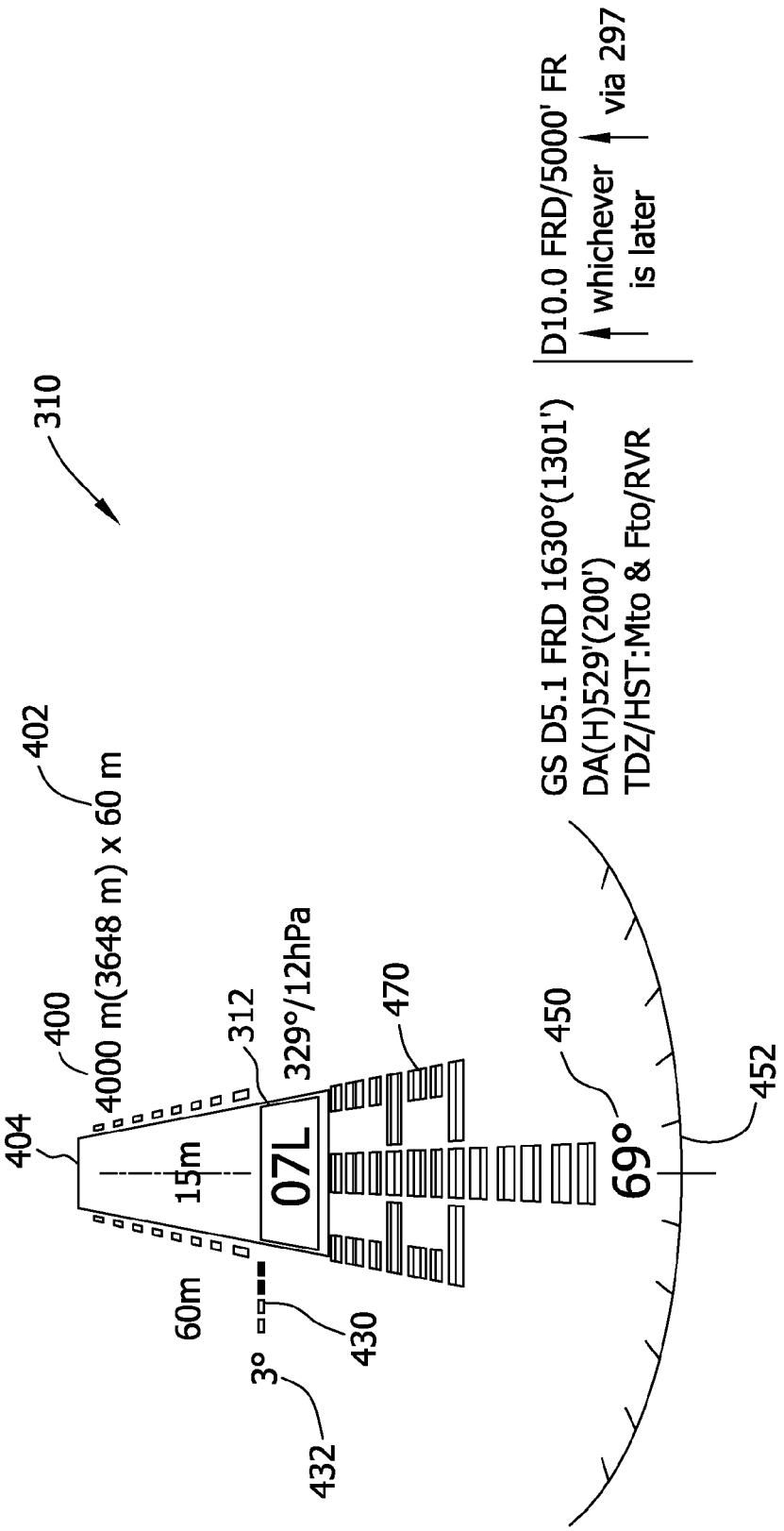

310
402
4000 m(3648 m) x 60 m
400
404
312
329°/12hPa
470
450
452
15m
07L
69°
60m
430
3°
432
GS D5.1 FRD 1630°(1301')
DA(H)529'(200')
TDZ/HST:Mto & Fto/RVR
D10.0 FRD/5000' FR
whichever is later
via 297

FIG. 4

FIG. 5

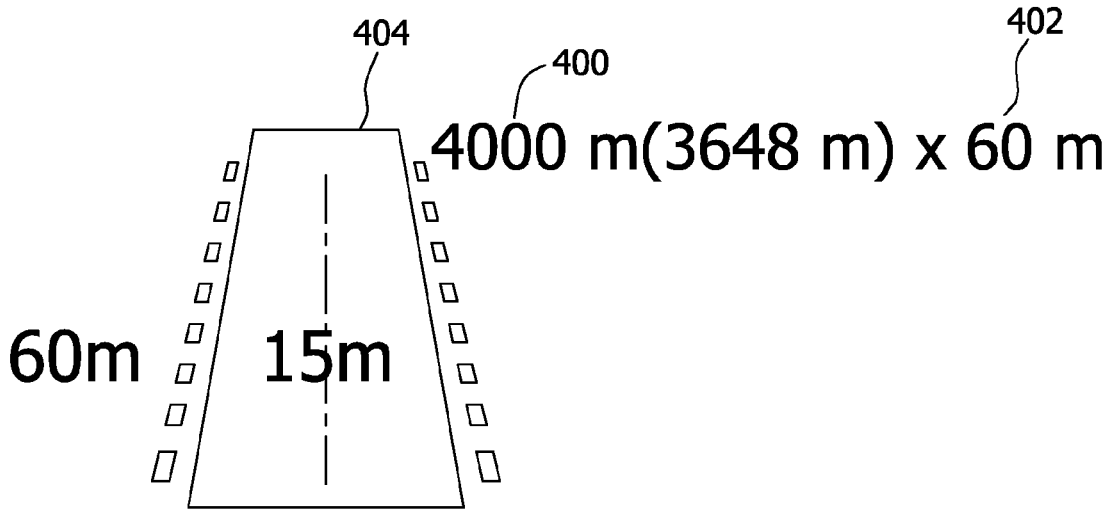


FIG. 6

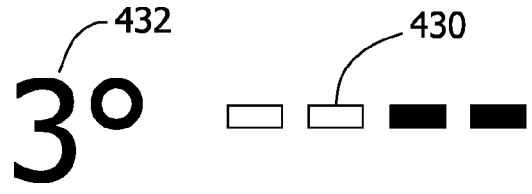


FIG. 7

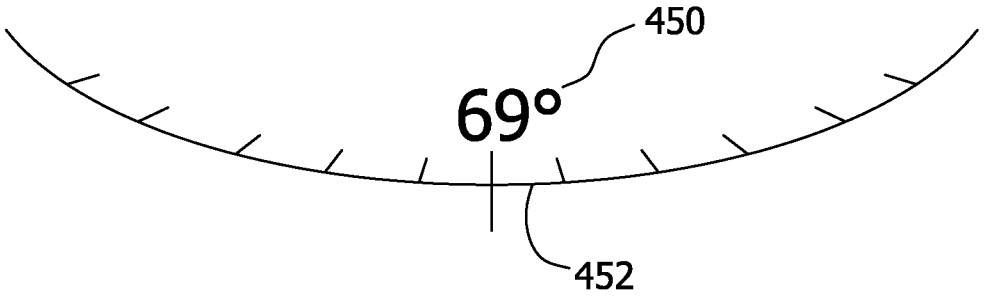


FIG. 8

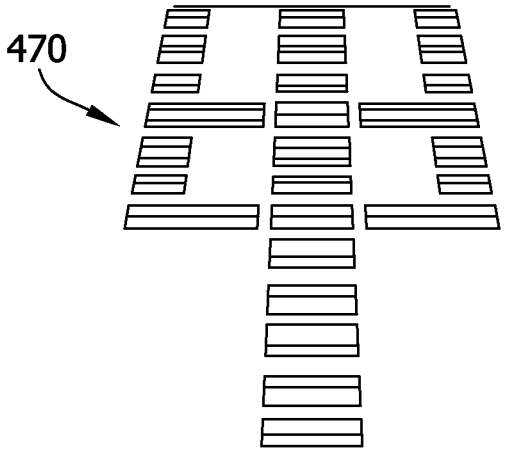


FIG. 9

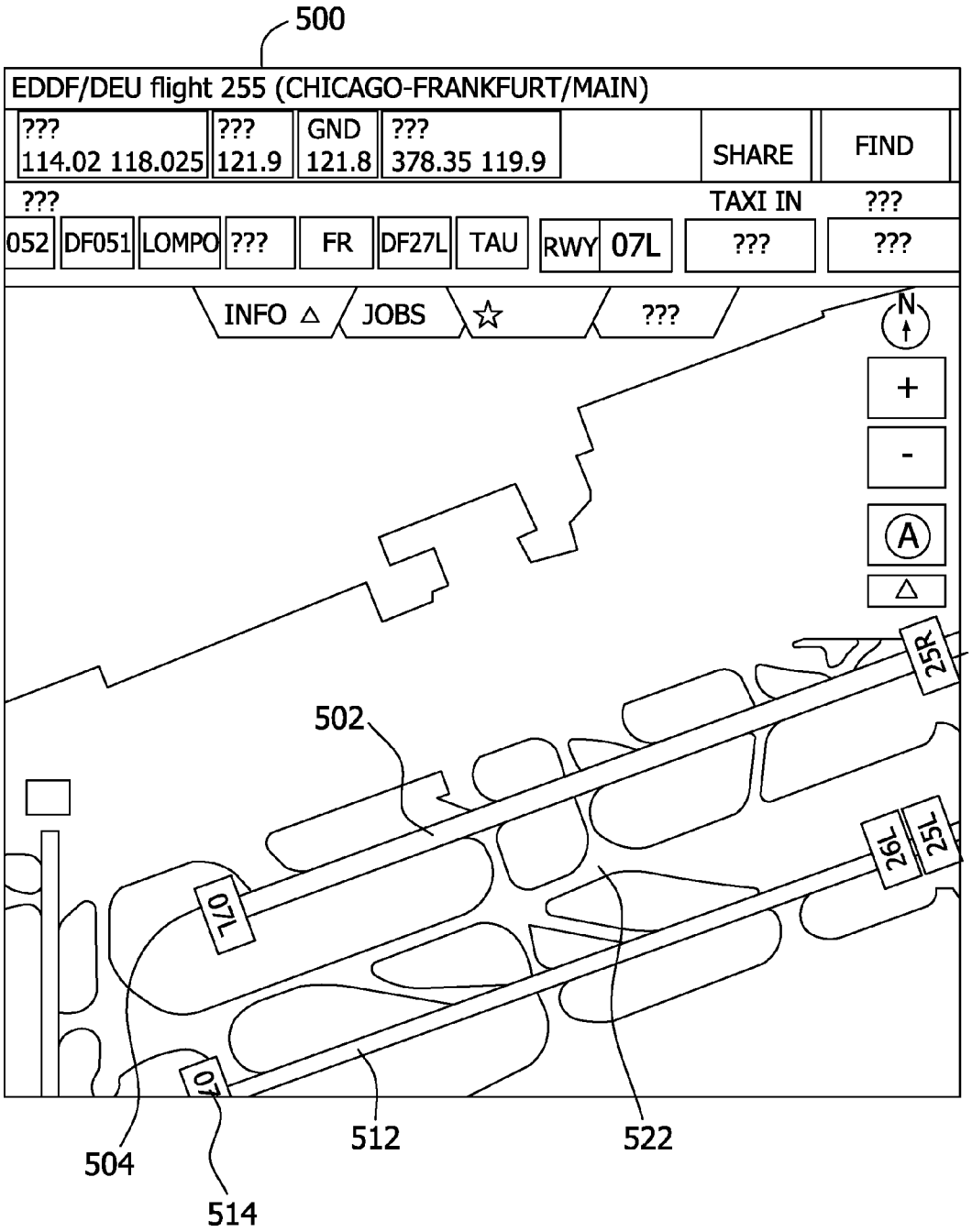
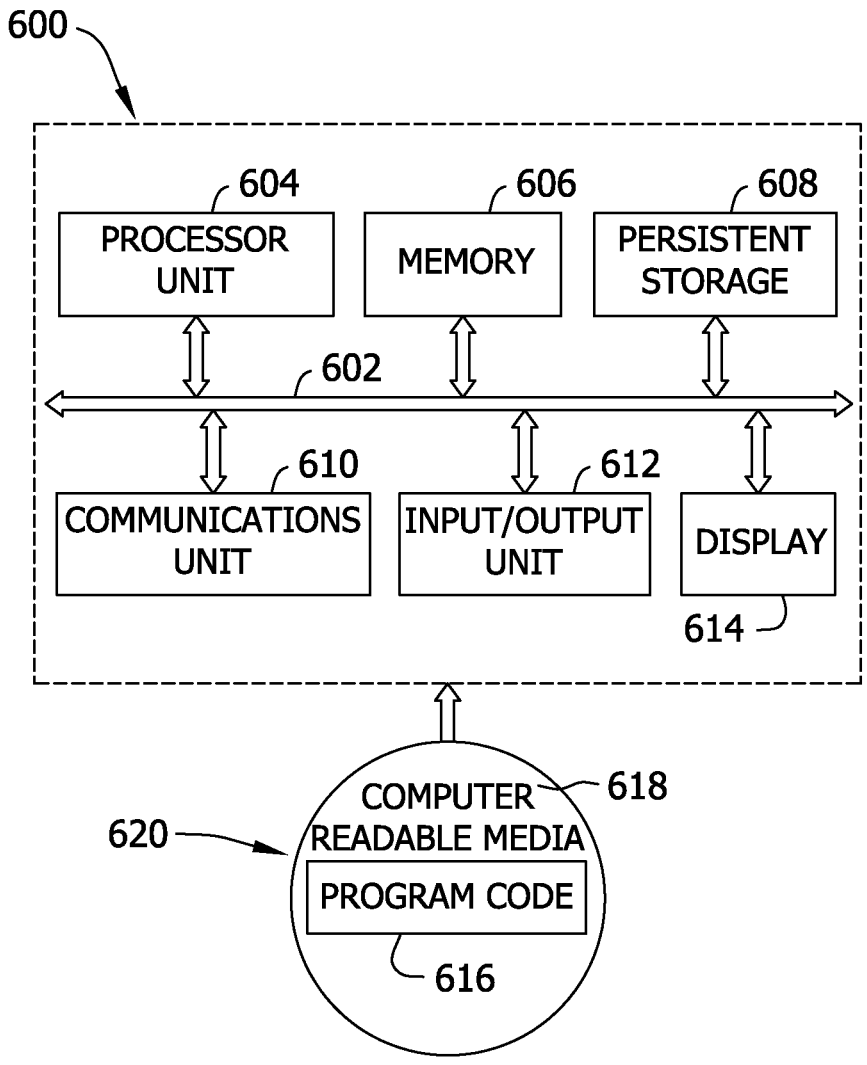

500
EDDF/DEU flight 255 (CHICAGO-FRANKFURT/MAIN)
???
114.02 118.025
???
121.9
GND
121.8
???
378.35 119.9
SHARE
FIND
???
TAXI IN
???
052
DF051
LOMPO
???
FR
DF27L
TAU
RWY
07L
???
???
INFO
JOBS
???
N
+
-
A
25R
502
25L
07L
07
504
514
512
522

FIG. 10


600
604
PROCESSOR UNIT
606
MEMORY
608
PERSISTENT STORAGE
602
610
COMMUNICATIONS UNIT
612
INPUT/OUTPUT UNIT
DISPLAY
614
COMPUTER READABLE MEDIA
618
620
PROGRAM CODE
616

METHODS AND SYSTEMS FOR INTEGRATING RUNWAY STATUS AND LAYOUT

BACKGROUND

The field of the disclosure relates generally to runway identification, and more specifically, to methods and systems for integrating runway status and layout.

Currently, pilots consult approach charts (electronic or paper) to retrieve the required information on runway layout (e.g. a runway lighting system). The pilots further retrieve runway status information via (D-)ATIS and radio. In addition, a meteorological aviation report system (METARS) provides weather related information and notices to air men systems (NOTAM) provide other relevant and current information related to a runway and/or airport which is being approached. Pilots mentally integrate all of this information with the approach chart information to form a mental picture of the airport and runway condition.

In addition to the taxing mental integration, the current approach methodology also results in problems in the identification of the correct runway when on approach. It is desirable, for example, to prevent a taxiway landing or a landing on a parallel runway. However, there have been no improvements in the easing of the mental tasks of pilots in regard to the deciphering of current state-of-the-art symbology for runway layout depiction.

BRIEF DESCRIPTION

In one aspect, a method for combining static runway information with runway status information for a selected runway is provided. The method includes retrieving, with a processing device, static runway information for the selected runway from at least one database, retrieving, with the processing device, runway status information for the selected runway from at least one source of dynamic runway status information, generating, through a program executing on the processing device, a depiction of the selected runway on at least one display device, and generating for display proximate the runway depiction, through the execution of the program, a plurality of contextual symbology associated with the runway, the symbology based on the retrieved static runway information and the retrieved dynamic runway status information.

In another aspect, a supplemental aeronautical information system is provided that includes a processing device operable to access a database of static runway information, a display device communicatively coupled to the processing device, and at least one communications interface associated with the processing device. The at least one communications interface is operable to receive dynamic runway status information from at least one source of dynamic runway status information. The processing device is programmed to generate data operable to cause the display device to depict a selected runway based on the static runway information and the dynamic runway status information and generate data operable to cause the display device to display, proximate the selected runway depiction, a plurality of contextual symbology associated with the selected runway, the contextual symbology based on the static runway information and the retrieved dynamic runway status information.

In still another aspect, one or more computer-readable storage media having computer-executable instructions embodied thereon are provided. When executed by at least one processor, the computer-executable instructions cause the at least one processor to retrieve static runway information and dynamic runway status information from a plurality of sources, generate a depiction of the selected runway on at least one display device, the depiction based on at least a portion of the static runway information and dynamic runway status information, and generate contextual symbology for display proximate the selected runway depiction, the contextual symbology based on at least a portion of the static runway information and dynamic runway status information.

The features, functions, and advantages that have been discussed can be achieved independently in various embodiments or may be combined in yet other embodiments further details of which can be seen with reference to the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a forward perspective view of an exemplary aircraft cockpit display panel.

FIG. **2** is a block diagram of a system that integrates runway information from multiple sources for display.

FIG. **3** is a depiction of an approach chart that is modified to include a graphical encoding of runway information.

FIG. **4** is an enlarged view of the runway information depicted in FIG. **3**.

FIG. **5** is a detailed illustration of runway symbology that is included in the runway information of FIG. **3**.

FIG. **6** is a detailed illustration of a precision approach path indicator (PAPI) configuration and glide-slope/descent angle that is included in the runway information of FIG. **3**.

FIG. **7** is a detailed illustration of true heading and partial compass rose which are integrated into the runway information of FIG. **3**.

FIG. **8** is a detailed illustration of RLS (Runway Lighting System) information that is included in the runway information of FIG. **3**.

FIG. **9** is an airport map display in which the selected runway and a label for the selected runway, are depicted in colors that are different than those used to depict other runways and labels in the airport map display.

FIG. **10** is a block diagram of one embodiment of a data processing system that might be implanted within the supplemental aeronautical information (SAI) system of FIG. **2**.

DETAILED DESCRIPTION

The described embodiments address the problem of identifying the correct runway when on approach, for example, to prevent a taxiway landing or a landing on a parallel runway. The embodiments further ease the mental task to (1) decipher current state-of-the-art symbology for runway layout depiction by integrating the runway status (e.g., inoperable) as retrieved via digital information systems such as digital automatic terminal information service (D-ATIS) with static runway information such as might be found in an airport mapping database, to (2) integrate runway state information (e.g., covered with snow) into the runway depiction and to (3) integrate runway occupancy information as retrieved via e.g. ADS-B. To accomplish the solutions described herein, a system is provided that integrates runway related information that has traditionally been provided in different datasets, providing to a pilot the integrated data in a contextual format.

FIG. **1** is a forward perspective view of an exemplary aircraft cockpit display panel **100** that includes at least one display screen **102** in accordance with an illustrative embodiment. In the illustrative embodiment, display screen is positioned on aircraft cockpit display panel **100**. In an alternative embodiment, display screen **102** is positioned on an auxiliary

panel (not shown) located in the cockpit of the aircraft. During aircraft operation, display screen **102** is available for viewing by a pilot and/or co-pilot of the aircraft. Display screen **102** may be used to view data included in an electronic flight bag **104**, which may be embodied as a standalone device such as, but not limited to a PDA, laptop PC, or portable touchscreen device, or as a software component of a system executing on a processor that is part of a subsystem of the aircraft.

In the exemplary embodiment, the electronic flight bag **104** includes an electronic storage device configured to store various user-configurable flight-related objects for all required and desired information for a particular flight, such as flight routes, as defined by, for example, way-points, airport information, temporary flight restrictions, and weather information as well as any other user-defined objects associated with a flight, ground operations, and/or flight planning. Certain of these include electronic versions of aviation charts and/or navigation charts, sometimes collectively referred to herein as electronic charts. The electronic flight bag **104** may receive data from various aircraft and ground sensors and systems, determines flight information based on the received data in real-time, and display the flight information and/or alerts to the flight crew through display screen **102** and other aural and/or visual indicators positioned on cockpit display panel **100**. In the illustrated embodiment, electronic flight bag **104** incorporates a display **106** through which at least a portion of the information described above might be presented. Such flight information provides the flight crew with additional situational awareness during all phases of aircraft operation.

FIG. **2** is a block diagram of a system **200** that integrates, for example, runway layout information from airport mapping databases (AMDB) **202**, runway status as retrieved via a digital information system such as D-ATIS **204**, and airborne navigation system database data, for example, from a navigation system **206** operating under the ARINC 424 standard for the preparation and transmission of data. As further described, system **200** to provide a situational awareness via an interface to one or more of the display screens **102**, **106** described above.

In alternative embodiments, system **200** might further incorporate one or more of a meteorological terminal aviation routine weather report or meteorological aviation report, collectively a METARS system **210**. Further embodiments might include a notices to air men (NOTAM) system **212** and/or a flight management controller (FMC) **214**. Other systems **216** that provide relevant runway information may be coupled to supplemental aeronautical information (SAI) system **220** in alternative embodiments.

In any configuration, the above described components of system **200** provide data to a supplemental aeronautical information (SAI) system **220**, which integrates the data provided by each system component for output onto a display, for example, an electronic flight bag (EFB) display **230**, a cockpit display, or a device such as a smart phone or portable touch screen device running an EFB application.

In regard to the components of system **200**, the SAI system **220** integrates runway related information from different datasets in order to provide a pilot the best possible information set and a context within which the integrated data may be utilized. The SAI system **220** collects all information to be presented on the EFB display **230**. For example, SAI system **220** receives database information such as an airport map database from AMDB **202**, including, but not limited to static runway information and an airport layout. The ARINC 424 information from navigation system **206** includes, for example, runway lighting information for a selected runway. Terminal charts may be included within navigation system **206** which provide one or more of runway lighting system information and a descent angle for runway approach. D-ATIS **204** reports runway operational condition for the selected runway (e.g., operational, not operational, only for taxiing, lighting out, runway closed, etc.) and METARS system **210** provides data relating to the current general condition of the selected runway (e.g., dry, wet, covered with slush, covered with snow, icy, etc.) are retrieved.

In embodiments, information may be utilized by the SAI system **220** such as relevant information regarding runway conditions as might be received via the notices to air men (NOTAM) system **212** and/or aircraft relevant information received from flight management controller (FMC) **214**. In alternative embodiments, other data may be utilized to provide a more complete runway condition solution and is signified in FIG. **2** as being provided by other systems **216**.

As shown in FIG. **3**, all of the available information from the plurality of runway information sources is integrated by the SAI system **220** to produce a graphical depiction of the runway on a display such as EFB display **230**. EFB display **230** may be thought of as a front-end application providing a user interface through which a user, such as a pilot, avails themselves to the information provided by SAI system **220**, which is then used by the flight crew to brief themselves on their approach.

More specifically, FIG. **3** is a depiction of an approach chart **300** that is modified to include a graphical encoding of runway information **310**. The runway information **310** is depicted as a pilot would see such information when looking out of the front window of the aircraft.

FIG. **4** is an enlarged view of runway information **310**. The runway operational status in respect to ownship is depicted as part of the runway symbology as will be described. In embodiments, the selected runway (07L) for landing is depicted with a label **312** in a color that is different from the labels associated with the other runways. In another embodiment, the runway is depicted in accordance with ambient lighting conditions (e.g., nighttime, daylight, etc.). In such embodiments and for example, the lighting along the sides of the runway is depicted more conspicuously for a nighttime approach then they are for a daytime approach. Such embodiments are controlled, for example, from data received from the FMC **214**.

As shown in FIG. **5**, and referencing runway information **310** in FIG. **4**, runway length **400** and width **402** retrieved from the ARINC 424 information within the navigation system **206** are integrated into the overall runway symbology. This information is compared to information retrieved from AMDB **202**, and in the case of discrepancies, the more constraining information will be presented to the user. In embodiments, a depiction for a state of the runway **404**, which is retrieved from the METARS system **210** is shown by the color in which the runway **404** is depicted. For example, a dry runway **404** might be depicted by gray. Further information such as runway exit information can be retrieved from AMDB **202**. In combination with a break-to-vacate system, aircraft mass and runway condition, one embodiment of SAI **220** indicates whether preferred exit is possible or not.

As shown in FIG. **6**, and again referencing runway information **310** in FIG. **4**, a PAPI lighting system configuration **430** and glide-slope/descent angle **432** are retrieved from the ARINC 424 database. As is known by those skilled in the art, a PAPI (precision approach path indicator) provides the pilot with a safe and accurate glide slope on final approach to the runway. A row of PAPI light housing assemblies (LHAs) are placed perpendicular to the approach path to be seen by the

pilot in combinations of red and white to indicate a path that is too high, too low or correctly on slope. Based on data received by the aircraft, the PAPI lighting configuration **430** is included in the runway information **310**, duplicating the information provided by the ground based PAPI lights.

FIG. **7** is a depiction of true heading **450** which is integrated into runway information **310** as a partial depiction of a compass rose.

FIG. **8** is a depiction of RLS (runway lighting system) information **470** that is retrieved from the ARINC 424 database within navigation system **206** and depicted in the runway information in a way comparable to the outside view presented to a pilot through the window of an aircraft.

The same depiction concepts as described above are used in other portions of the applications that generate runway related displays, for example, as shown in FIG. **9**. FIG. **9** is an airport map display **500** in which the selected runway **502**, as well as a label **504** for the runway **502**, are depicted in colors that are different from another runway **512** and its associated label **514**. A taxiway **522** between runways **502** and **512** is depicted in a third color.

Turning now to FIG. **10**, a diagram of one embodiment of a data processing system **600** that might be implanted within the SAI system of FIG. **2** is depicted in accordance with an illustrative embodiment. In this illustrative example, data processing system **600** includes communications fabric **602**, which provides communications between processor unit **604**, memory **606**, persistent storage **608**, communications unit **610**, input/output (I/O) unit **612**, and display **614**.

Processor unit **604** serves to execute instructions for software that may be loaded into memory **606**. Processor unit **604** may be a set of one or more processors or may be a multiprocessor core, depending on the particular implementation. Further, processor unit **604** may be implemented using one or more heterogeneous processor systems in which a main processor is present with secondary processors on a single chip. As another illustrative example, processor unit **604** may be a symmetric multi-processor system containing multiple processors of the same type.

Memory **606** and persistent storage **608** are examples of storage devices. A storage device is any piece of hardware that is capable of storing information either on a temporary basis and/or a permanent basis. Memory **606**, in these examples, may be, for example, without limitation, a random access memory or any other suitable volatile or non-volatile storage device. Persistent storage **608** may take various forms depending on the particular implementation. For example, without limitation, persistent storage **608** may contain one or more components or devices. For example, persistent storage **608** may be a hard drive, a flash memory, a rewritable optical disk, a rewritable magnetic tape, or some combination of the above. The media used by persistent storage **608** also may be removable. For example, without limitation, a removable hard drive may be used for persistent storage **608**.

Communications unit **610**, in these examples, provides for communications with other data processing systems or devices. In these examples, communications unit **610** is a network interface card. Communications unit **610** may provide communications through the use of either or both physical and wireless communication links.

Input/output unit **612** allows for input and output of data with other devices that may be connected to data processing system **600**. For example, without limitation, input/output unit **612** may provide a connection for user input through a keyboard and mouse. Further, input/output unit **612** may send output to a printer. Display **614** provides a mechanism to display information to a user.

Instructions for the operating system and applications or programs are located on persistent storage **608**. These instructions may be loaded into memory **606** for execution by processor unit **604**. The processes of the different embodiments may be performed by processor unit **604** using computer implemented instructions, which may be located in a memory, such as memory **606**. These instructions are referred to as program code, computer usable program code, or computer readable program code that may be read and executed by a processor in processor unit **604**. The program code in the different embodiments may be embodied on different physical or tangible computer readable media, such as memory **606** or persistent storage **608**.

Program code **616** is located in a functional form on computer readable media **618** that is selectively removable and may be loaded onto or transferred to data processing system **600** for execution by processor unit **604**. Program code **616** and computer readable media **618** form computer program product **620** in these examples. In one example, computer readable media **618** may be in a tangible form, such as, for example, an optical or magnetic disc that is inserted or placed into a drive or other device that is part of persistent storage **608** for transfer onto a storage device, such as a hard drive that is part of persistent storage **608**. In a tangible form, computer readable media **618** also may take the form of a persistent storage, such as a hard drive, a thumb drive, or a flash memory that is connected to data processing system **600**. The tangible form of computer readable media **618** is also referred to as computer recordable storage media. In some instances, computer readable media **618** may not be removable.

Alternatively, program code **616** may be transferred to data processing system **600** from computer readable media **618** through a communications link to communications unit **610** and/or through a connection to input/output unit **612**. The communications link and/or the connection may be physical or wireless in the illustrative examples. The computer readable media also may take the form of non-tangible media, such as communications links or wireless transmissions containing the program code.

In some illustrative embodiments, program code **616** may be downloaded over a network to persistent storage **608** from another device or data processing system for use within data processing system **600**. For instance, program code stored in a computer readable storage medium in a server data processing system may be downloaded over a network from the server to data processing system **600**. The data processing system providing program code **616** may be a server computer, a client computer, or some other device capable of storing and transmitting program code **616**.

The different components illustrated for data processing system **600** are not meant to provide architectural limitations to the manner in which different embodiments may be implemented. The different illustrative embodiments may be implemented in a data processing system including components in addition to or in place of those illustrated for data processing system **600**. Other components shown in FIG. **6** can be varied from the illustrative examples shown.

As one example, a storage device in data processing system **600** is any hardware apparatus that may store data. Memory **606**, persistent storage **608** and computer readable media **618** are examples of storage devices in a tangible form.

In another example, a bus system may be used to implement communications fabric **602** and may be comprised of one or more buses, such as a system bus or an input/output bus. Of course, the bus system may be implemented using any suitable type of architecture that provides for a transfer of data between different components or devices attached to the bus

system. Additionally, a communications unit may include one or more devices used to transmit and receive data, such as a modem or a network adapter. Further, a memory may be, for example, without limitation, memory **606** or a cache such as that found in an interface and memory controller hub that may be present in communications fabric **602**.

In one embodiment, technical effects of the methods, systems, and computer-readable media described herein include at least one of: (a) retrieving static runway information for the selected runway from at least one database, (b) retrieving runway status information for the selected runway from at least one source of dynamic runway status information, (c) generating, though program execution, a depiction of the selected runway on at least one display device, and (d) generating for display proximate the runway depiction, through the execution of the program, a plurality of contextual symbology associated with the runway, the symbology based on the retrieved static runway information and the retrieved dynamic runway status information.

As used herein, an element or step recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural elements or steps unless such exclusion is explicitly recited. Furthermore, references to "one embodiment" of the present invention or the "exemplary embodiment" are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features.

The description of the different advantageous embodiments has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the embodiments in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. Further, different advantageous embodiments may provide different advantages as compared to other advantageous embodiments. The embodiment or embodiments selected are chosen and described in order to best explain the principles of the embodiments, the practical application, and to enable others of ordinary skill in the art to understand the disclosure for various embodiments with various modifications as are suited to the particular use contemplated.

This written description uses examples to disclose various embodiments, which include the best mode, to enable any person skilled in the art to practice those embodiments, including making and using any devices or systems and performing any incorporated methods. The patentable scope is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

What is claimed is:

1. A method for combining runway map information with runway status information for a selected runway, said method comprising:

retrieving, with a processing device, runway map information for the selected runway from at least one database, the runway map information including runway exit information for the selected runway;

retrieving, with the processing device, runway status information, including runway condition information, for the selected runway from at least one source of runway status information;

generating, by the processing device, exit availability information by determining from a mass of an aircraft approaching the selected runway, the runway exit information, and the runway condition information, whether the aircraft is capable of exiting the selected runway at a predefined location;

generating, through a program executing on the processing device, a depiction of the selected runway on at least one display device; and

generating for display proximate the runway depiction, through the execution of the program, a plurality of contextual symbology associated with the runway, the symbology based on the retrieved runway map information and the retrieved runway status information, the contextual symbology including the exit availability information.

2. The method according to claim **1** wherein, the selected runway is a first runway and generating a depiction of the selected runway comprises depicting the first runway and a first indicator for the first runway in first colors that are different than second colors used to depict at least one second runway and at least one second indicator for the at least one second runway.

3. The method according to claim **1** wherein generating a depiction of the selected runway comprises depicting the selected runway in a color based on data relating to a current general condition of the selected runway received within at least one of a meteorological terminal aviation routine weather report or a meteorological aviation report.

4. The method according to claim **1** wherein generating for display proximate the runway depiction a plurality of contextual symbology comprises displaying dimensions of the selected runway proximate the depiction of the selected runway.

5. The method according to claim **1** wherein generating for display proximate the runway depiction a plurality of contextual symbology comprises depicting a current PAPI lighting configuration and displaying a glide slope angle for the selected runway proximate the depiction of the selected runway.

6. The method according to claim **1** wherein generating for display proximate the runway depiction a plurality of contextual symbology comprises displaying a true heading angle and a portion of a compass rose proximate the depiction of the selected runway.

7. The method according to claim **1** wherein generating for display proximate the runway depiction a plurality of contextual symbology comprises depicting a runway lighting system proximate the depiction of the selected runway as the runway lighting system would be viewed with respect to the runway through a window of the aircraft.

8. The method according to claim **1** wherein retrieving runway status information for the selected runway comprises retrieving runway status information from a plurality of a digital automatic terminal information service, a navigation system providing airport and runway data under ARINC 424, one or more of a meteorological terminal aviation routine weather report or meteorological aviation report, a notices to air men (NOTAM) system, and a flight management controller.

9. The method according to claim **1** wherein retrieving runway map information for the selected runway comprises retrieving runway map information from an airport mapping database.

10. The method according to claim **1** wherein generating a depiction of the selected runway comprises depicting the selected runway on at least one of an electronic display of an approach chart and an electronic display of an airport map.

11. A supplemental aeronautical information system comprising:

a processing device operable to access a database of runway map information including runway exit information for a selected runway;

a display device communicatively coupled to said processing device; and

at least one communications interface associated with said processing device, said at least one communications interface operable to receive runway status information, including runway condition information, from at least one source of runway status information, said processing device programmed to:

generate exit availability information by determining from a mass of an aircraft approaching the selected runway, the runway exit information, and the runway condition information, whether the aircraft is capable of exiting the selected runway at a predefined location;

generate data operable to cause said display device to depict the selected runway based on the runway map information and the runway status information; and

generate data operable to cause said display device to display, proximate the selected runway depiction, a plurality of contextual symbology associated with the selected runway, the contextual symbology based on the runway map information and the retrieved runway status information, the contextual symbology including the exit availability information.

12. The supplemental aeronautical information system according to claim **11** wherein the selected runway is a first runway and to generate data operable to cause said display device to depict the selected runway said processing device is programmed to depict the first runway and a first indicator for the first runway in first colors that are different than second colors used to depict at least one second runway and at least one second indicator for the at least one second runway in the depiction.

13. The supplemental aeronautical information system according to claim **11** wherein to generate data operable to cause said display device to depict a selected runway said processing device is programmed to depict the selected runway in a color based on data relating to a current general condition of the selected runway received within at least one of a meteorological terminal aviation routine weather report or a meteorological aviation report.

14. The supplemental aeronautical information system according to claim **11** wherein to generate data operable to cause said display device to display a plurality of contextual symbology, said processing device is programmed to display the dimensions of the selected runway proximate the depiction of the selected runway.

15. The supplemental aeronautical information system according to claim **11** wherein to generate data operable to cause said display device to display a plurality of contextual symbology, said processing device is programmed to depict a current precision approach path indicator (PAPI) lighting configuration and display a glide slope angle for the selected runway proximate the depiction of the selected runway.

16. The supplemental aeronautical information system according to claim **11** wherein to generate data operable to cause said display device to display a plurality of contextual symbology, said processing device is programmed to display a true heading angle and a portion of a compass rose proximate the depiction of the selected runway.

17. The supplemental aeronautical information system according to claim **11** wherein to generate data operable to cause said display device to display a plurality of contextual symbology, said processing device is programmed to depict a radar landing system proximate the depiction of the selected runway as the radar landing system would be viewed with respect to the runway through a window of the aircraft.

18. The supplemental aeronautical information system according to claim **11** wherein said at least one communications interface is communicatively coupled to receive runway status information originating from a plurality of a digital automatic terminal information service, a navigation system providing airport and runway data under ARINC 424, one or more of a meteorological terminal aviation routine weather report or meteorological aviation report, a notices to air men (NOTAM) system, and a flight management controller.

19. The supplemental aeronautical information system according to claim **11** wherein to generate data operable to cause said display device to depict a selected runway and display a plurality of contextual symbology associated with the selected runway, said processing device is programmed to depict the selected runway and display the plurality of contextual symbology on at least one of an electronic display of an approach chart and an electronic display of an airport map.

20. One or more non-transitory computer-readable storage media having computer-executable instructions embodied thereon, wherein when executed by at least one processor, the computer-executable instructions cause the at least one processor to:

retrieve runway map information and runway status information from a plurality of sources, the runway map information including runway exit information for a selected runway and the runway status information including runway condition information for the selected runway;

generate exit availability information by determining from a mass of an aircraft approaching the selected runway, the runway exit information, and the runway condition information, whether the aircraft is capable of exiting the selected runway at a predefined location;

generate a depiction of the selected runway on at least one display device, the depiction based on at least a portion of the runway map information and runway status information; and

generate contextual symbology for display proximate the selected runway depiction, the contextual symbology based on at least a portion of the runway map information and runway status information, the contextual symbology including the exit availability information.

* * * * *